IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	
Mark Myers et al.	Group Art Unit: 2878
Application No.: 09/988,660	Examiner: Shun K. Lee
Filed: November 20, 2001	Confirmation No.: 9021
For: MULTIBAND SINGLE ELEMENT WIDE FIELD OF VIEW INFRARED IMAGING SYSTEM	

REPLY BRIEF

Commissioner for Patents
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Sir:

In reply to the Examiner's Answer dated January 5, 2006, Appellants offer the following additional comments.

A. The grounds for rejection fail to disclose, or suggest, all of the claimed features

As stated in M.P.E.P. §2143.03:

> To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). (Emphasis added).

Claim 4 recites:

> 4. An infrared imaging apparatus comprising:
> a dewar, having an internal volume that defines a cold space;
> an IR transmissive window that seals the cold space to receive IR energy directly from an IR source;
> a first lens located within the cold space to receive IR energy directly from the IR transmissive window;

> **an IR detector** located within the cold space in operational communication with the first lens and positioned **coincident to a focal plane of at least a first and second wavelength of IR energy**; and
> an optical stop located within the cold space in front of the first lens,
> wherein the first lens has a first aspheric profile on a first side and a second aspheric profile on a second side, the first side parallel to the second side and the second side facing the detector,
> wherein the second aspheric profile has a holographic optical element, and
> wherein **the holographic optical element color corrects a first color band of infrared energy having wavelengths of 3 to 5 micrometer and coincidently focuses at the common focal plane the first color band and a second color band of infrared energy having wavelengths of 8 to 12 micrometer**.

As evident from the above, the presently claimed invention requires, *inter alia*: (1) an imaging apparatus that discriminates and propagates at least two wavelengths of infrared energy, both coincident upon the infrared detector at the focal plane; AND (2) a holographic optical element (HOE) which color corrects at least a first and second color band of infrared energy having wavelengths of 3 to 5 μm and 8 to 12 μm, respectively.

Requirement (1) refers to the fact that the imaging apparatus of the present invention concurrently collects radiation from multiple spectral radiation bands. Such imaging apparatus or are commonly referred to in the art as "dual-wavelength" imagers, or "hyperspectral" imagers (see, e.g., U.S. Patent No. 6,180,990, incorporated into the present application by reference). These devices represent a distinct class of imagers. More conventional imagers discriminate and propagate infrared energy corresponding to a single wavelength, or band of wavelengths. The images produced by devices of the type recited by the presently claimed invention can be relatively superior due to the fact that the image is created by sampling multiple wavelength bands of infrared energy.

None of the cited prior art, taken alone, or in combination, disclose or even suggest this requirement of the presently claimed invention.

Howard et al. admittedly fails to disclose, or suggest, this aspect of the presently claimed invention (see, e.g., page 5 of the Examiner's Answer).

Ben-Menachem et al. discloses a precision double-sided aspheric element, and a chuck arrangement for machining the same. The optical arrangement disclosed by Ben-Menachem et al. is explicitly described as one of the more conventional types of optical arrangements designed to propagate energy of a single wavelength, or single band of wavelengths, onto an imager: "for use in an infra-red thermal imaging system, operating in the 8 to 12 μm **or** the 3 to 5 μm wavelength region" (paragraph [0060]). This interpretation has not been contested by the Examiner.

Contrary to the assertions made in the Examiner's Answer, Amos fails to cure this deficiency. Amos teaches an arrangement which provides an "on-axis" structure for use in holography, which advantageously suppresses zero order transmissions:

> In both the truncated pyramid and truncated cone approach, the object in reference beams coincide with the axis 50 instead of being angularly displaced with respect to one another, as is the case with conventional holography. By utilizing the series of nested conical (21) or pyramidal (31) surfaces as illustrated, the zero order is sufficiently suppressed by the time the light arrives at the hologram 43 so as to become a nullity, eliminating difficulties, such as double-holographic images and blurred holographic images or other aberrations. (Column 9, lines 13-22).

Amos fails to disclose an arrangement having any type of IR detector, much less one in which at least two wavelengths of infrared energy are discriminated and propagated such that they are both coincident upon an IR detector at the focal plane.

With regard to requirement (2), the presently claimed invention recites a holographic optical element (HOE) which color corrects at least a first and second color band of infrared energy having wavelengths of 3 to 5 μm and 8 to 12 μm, respectively.

Howard et al. admittedly fails to disclose, or suggest, this aspect of the presently claimed invention (see, e.g., page 4 of the Examiner's Answer).

Ben-Menachem et al. discloses, in very general terms, an aspheric lens, which may include a diffractive structure thereon:

> . . . a diffractive structure, generally in the form of a number of concentric grooves or steps, with a defined profile, position and surface profile between the grooves or steps. This structure then adds diffractive and dispersive power to the element, and is used to further correct for residual aberrations present in the element. (Paragraph [0075])

However, Ben-Menachem et al. fails to disclose, or suggest, a holographic optical element (HOE) which color corrects at least a first and second color band of infrared energy having wavelengths of 3 to 5 μm and 8 to 12 μm, respectively.

Amos also fails to disclose, or suggest, this aspect of the presently claimed invention. The grounds for rejection specifically identified two portions of the Amos disclosure as containing the teachings necessary to satisfy this requirement of the presently claimed invention. These portions are: (1) column 5, lines 11-15; and (2) column 18, lines 47-60.

Portion (1) appears at the end of the Summary of the Invention section of the application, and is reproduced as follows:

> It is again emphasized that the principles of the instant invention are applicable to the entire electromagnetic spectrum and are not limited to conventional holography or to the visual or near-visual spectra, such as ultraviolet and infrared frequencies or x-rays. (Emphasis added)

It is respectfully submitted that this portion of the Amos disclosure has been misinterpreted such that it does not suggest the full scope of what has been alleged in the grounds for rejection. The underlined portions of the above-quoted portion of the Amos disclosure must be analyzed in order to understand the context of the above quoted passage. The first portion of the above quoted passage reads "It is again emphasized. . ." thereby implying that the above quoted passage is a reiteration of previous portions of the Amos disclosure. For example, as disclosed in column 3:

> While holography is generally considered to be a phenomenon primarily of interest with respect to the entire electromagnetic spectrum for the display of images utilizing complex light beams or manipulation of optical information utilizing laser beams, many of the same principles which are applicable to visible light are also applicable to other portions of the electromagnetic spectrum such as infrared and ultraviolet radiation, radiowaves, and x-rays. There is a need for a device which extends the optical principles utilized in holography to other manipulations of electromagnetic radiation.

The second underlined portion of the above quoted passage reads "the principles of the instant invention are applicable to the entire electromagnetic spectrum." It should be noted that at this point of the Amos disclosure, nothing has been mentioned with regard to the concept of using binary optics for chromatic correction purposes (as in the other identified portion appearing in column 18 of Amos). The only "principles of the present invention" discussed in this portion of the Amos disclosure involves the on-axis holographic arrangement including at least one conical or one pyramidal element. The least one conical or pyramidal element is able to transmit light, or other electromagnetic radiation, to produce a holographic effect, and which also suppresses zero order transmissions.

The second identified portion of the Amos disclosure appears in column 18, and is reproduced below:

> F. Binary Optics Applications
>
> The refractive or light bending properties of the conical pyramidal/polygonal section surfaces on both the interior and on the exterior surfaces in both the reflection and transmission modes can be enhanced using binary optics techniques. In addition, one may employ both the normal refractive properties of a glass or plastic lens and the properties of a diffractive lens, including diffractive components such as holographic optical elements. Such combinations solve numerous problems associated with normal refractive lenses. Essentially, refractive lenses bend light comprised of different wavelengths, such as white light, causing some wavelengths to bend more than others. For example, red light will focus at a different point than blue. However, binary optics techniques add a notched diffractive component to the refractive lens so that chromatic aberration is corrected. This results in all wavelengths of the light being combined at a point or focus. The generator 20, according to the instant invention, behaves as a refractive lens when silvered or overlaid with a first surface mirror of silver or gold. The generator 20 is in essence a diverging lens and a converging lens. When using silver or gold, the generator uses refraction, however, in some instances, it displays chromatic aberration which can be corrected or lessened by optical methods. However, holograms are diffractive elements and generally break light up by sharp edges and narrow apertures. Therefore, on a reflective generator's exterior section surfaces and on its interior surfaces (converging side), diffraction patterns can be carved which are in essence a plethora of tiny staircase-type notches. Accordingly, as more generator sections are added, the resolution of the image improves and the combination of binary optics with a generator-lens can dramatically improve its lens properties. Photolithographic and chemical vapor deposition techniques which are known to those skilled in the art can be used in the fabrication of the generators wherein literally thousands (or more) generator sections can be configured on a generator. Moreover, if a binary approach is applied to the generators, the natural zero order eliminating properties, as well as the generators diverging and converging properties, will be enhanced. (Emphasis added).

It is respectfully submitted that the above portion of the Amos disclosure does not lead one of ordinary skill in the art any closer the claimed invention than the teachings of Ben-Menachem et al. The above quoted disclosure states nothing

more than binary optics can be used, in combination with the conical or pyramidal lens construction of Amos, to make color corrections. However, there is no suggestion of the specific holographic optical element (HOE) construction recited in claim 4 which color corrects at least a first and second color band of infrared energy having wavelengths of 3 to 5 μm and 8 to 12 μm, respectively.

The only spectrum of light mentioned in column 18 of Amos on connection with chromatic corrections utilizing binary optics is visible "white light." The grounds for rejection point to the use of the phrase "all wavelengths" as being indicative of teaching color correction of the claimed wavelength bands of IR radiation. This assertion is respectfully traversed. The phrase "all wavelengths" is clearly modified by the phrase "of the light." The only light mentioned is visible spectrum "white light," and not IR spectrum energy.

The grounds for rejection refer back to the disclosure contained in column 5 in support of the apparent assertion that the above quoted portion of the disclosure contained in column 18 stands for the proposition that Amos would have suggested the one of ordinary skill in the art a construction which is capable of chromatic correction of "the entire electromagnetic spectrum," which would encompass the claimed IR wavelength bands. The suggestion that Amos teaches one of ordinary skill in the art how to produce a structure that is capable of color correcting every wavelength of energy in the entire electromagnetic spectrum so that all wavelengths of the electromagnetic spectrum have a common focal plane is outlandish. By way of technical background information, reference is made to the previously submitted portions of "Optical Design Fundamentals for Infrared Systems" by Max J. Reidl. Given the number of variables involved, it can be readily appreciated that the

teachings of Amos fail to provide one of ordinary skill in the art with a reasonable expectation of success for making the proposed combination. Namely, given the teachings of Amos, one of ordinary skill in the art would not have a reasonable expectation of successfully producing a construction which is capable of chromatic correction of all wavelengths present in the entire electromagnetic spectrum. Thus, the rejection is improper and must be reversed. *Noelle v. Lederman*, 355 F.3d 1343, 69 USPQ2d 1508 (Fed. Cir. 2004).

Using applicant's own disclosure as a guide, the grounds for rejection clearly attempt to extract a specific teaching of color correction of at least a first and second color band of infrared energy having wavelengths of 3 to 5 μm and 8 to 12 μm out of the broad disclosure of Amos, which in fact gives no particular guidance in this regard. In essence, the grounds for rejection attempt to improperly meld the concepts of inherency and obviousness. However, assertions of obviousness cannot be predicated upon inherent features or characteristics when there is no supporting teaching in the prior art. *In re Newell*, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1999) ("a retrospective view of inherency is not a substitute for some teaching or suggestion which supports the selection and use of the various elements in a particular claimed combination"); *In re Spormann*, 363 F.2d 444, 150 USPQ 449 (C.C.P.A. 1966).

B. The Grounds for Rejection Improperly Fail to Consider Those Portions of the Prior Art Which Teach Away From the Claimed Invention

A rejection under 35 U.S.C. §103 is improper if it can be shown that he applied prior art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1469, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997). A

reference can be said to "teach away" when a person of ordinary skill in the art, upon considering the reference house a whole, would be led in a direction which diverges from the path that was taken by the applicant. *Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360, 52 USPQ2d 1294, 1298 (Fed. Cir. 1999).

Howard et al. teaches an optical arrangement in which a spherical lens (12) is provided within a cold space, and wherein an aspheric lens in the form of an aspheric Schmidt correction plate (18) is placed outside of the cold space. See, e.g. column 2, lines 21-24 ("an aspheric corrector plate (or "Schmidt plate") may be placed at or near the aperture stop in order to correct a spherical aberration of the imaging lens"). Thus, according to the teachings of Howard et al., the only aspheric lens element is provided outside of the cold space. By contrast, the presently claimed invention requires the aspheric lens to be located within the cold space.

Amos emphasizes over and over again the importance of directing electromagnetic energy over the lens having at least one conical or pyramidal surface. For example:

> In view of this and other objects, the instant invention contemplates a method of manipulating a beam of electromagnetic energy by directing the energy over a least one conical or pyramidal surface and impinging the energy on device capable of utilizing the energy in a useful fashion. Moreover, in a broad sense, the instant invention is also directed to at least one conical or pyramidal element arranged and configured to accomplish the purposes of the method. (Column 4, lines 3-11).

By contrast, claim 4 the present invention requires, *inter alia*, "the first lens has a first aspheric profile on the first side and a second aspheric profile on the second side, the first side parallel to the second side and the second side facing the detector." When considered as a whole, one of ordinary skill in the art would have been led to form a lens or "generator" in the form of one or more conical or pyramidal

surfaces, and thus would not have utilized an aspheric lens having the construction set forth above and recited in claim 4.

It is clear that the grounds for rejection are based on a selection of a narrow portion of the teachings contained in Amos, and simply ignore the main suggestion of the reference, which is to utilize one or more conical or pyramidal surfaces to direct light or energy in the desired manner while avoiding zero order transmissions. Thus, the rejection is improper and must be reversed. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 230 USPQ 416 (Fed. Cir. 1986).

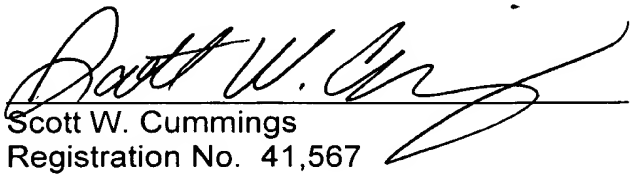
Conclusion

Appellants respectfully submit that the various elements of the claims are not taught or suggested by the applied art when taken alone or in combination, and that the grounds for rejection improperly and selectively pick and choose from amongst the various teachings contained therein to reconstruct the presently claimed invention with the aid of hindsight. For at least the reasons given above and in the Appeal Brief of November 4, 2005, Appellants respectfully request that the Board overturn the Examiner's rejections.

Respectfully submitted,

BUCHANAN INGERSOLL PC

Date: February 28, 2006

By: 
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